Trace element mobility in the presence of organic acids: A potential "organomarker"?

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Vascular plants, fungi, lichen, and bacteria all produce organic acids, which can strongly affect weathering by increasing the solubility and mobility of elements. The effect of these organic acids on rocks, minerals and soils may produce a long-lasting and stable "organomarker", which might record life on early earth or Mars.

To determine the effect of organic acid on basalt dissolution, powdered Columbia River basalt was dissolved in the presence of 0.01 M citrate, and deionized water, in long-term column dissolution experiments. In previous experiments, citrate significantly enhanced element mobilization from basalt. The pH of the input solutions was adjusted to 6. Sodium azide or lithium azide was added to prevent microbial growth, and two empty columns were also eluted with identical inlet solutions as controls.

Preliminary results indicate that the elements Sr, Y, Zr, La, Ce, W, Th, Mg, Al, P, Ca, Sc, Ti, V, Cr, Mn, Co, Ni, Zn, Fe and Si may be leached from the basalt to a greater extent in the presence of the citrate as compared to ligand-free solution. Further work is needed to quantify and better understand this effect, but these results indicate that elemental patterns in paleosols and weathered rock may be useful as "organomarkers" and as potential indications of life, both on Mars and on early earth.